



TULSA
IGSHPA
Conference & Expo
OCTOBER 5-6
TULSA, OK

MARKETING IN K-12 MARKETS

Thursday Oct 6, 2011

Don Penn, PE, CGD



Grapevine

Scottsdale



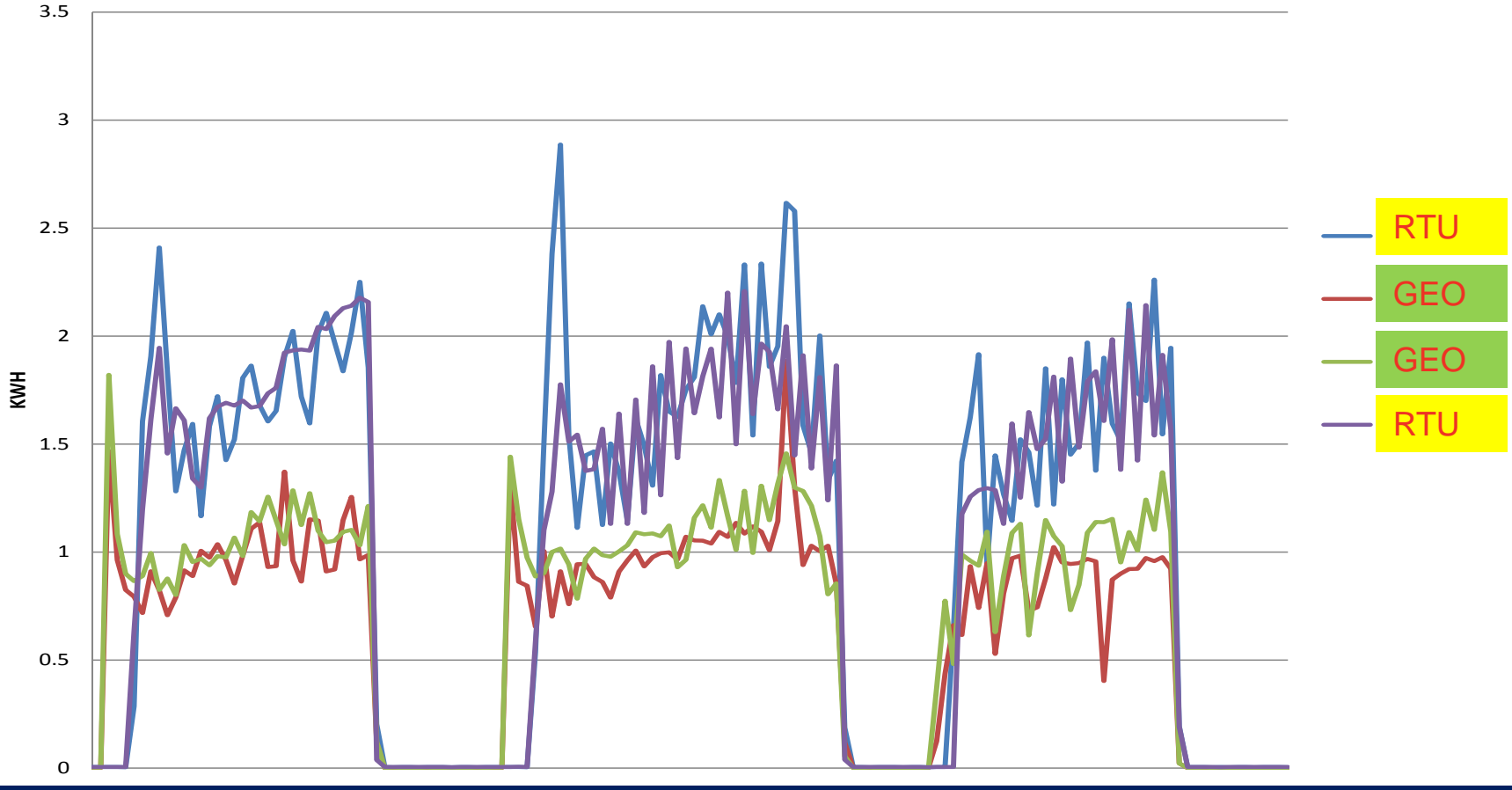


DESERT VIEW ELEMENTARY SCHOOL



45% ENERGY SAVINGS

Desert View - August 10, 11, 12, 2011



TERMINOLOGY

Geothermal Source Heat Pump System

Geothermal Heat Pump System

Ground Coupled Heat Pump System

GeoExchange

Geothermal Well ???

Not hot rocks.....

USE SIMPLE ANALOGIES

Refrigerator-controlled environment

Condensing Unit in Neighbors House

Long Compressor life – no hard starting

Establish Engineer/Mechanical Contractor/Well Driller Team – IGSHPA Certifications/ Team

Introducing the system: Strategies

- 1. Terminology*
- 2. Develop an understanding of the system installation, maintenance and operation – simple system, uses refrigerant*
- 3. Develop comfort level of system with the Client*
- 4. Discuss benefits and installation strategies*
- 5. Discuss issues and complications*
- 6. Economics aspects – payback/life cycle*
- 7. Introduce to other school district with successful systems...*
- 8. Propose pilot project*

GEOHERMAL SYSTEM – BENEFITS/ INTANGIBLES



- **Environment**
 - “Renewable Resource” Tax Credits
 - USGBC Approved: 8-10 LEED points
 - IAQ Friendly: Increased latent capacity improves humidity control vs. RTUs
 - No water treatment: Water resource not required
 - For every hour of use, a Geoexchange system produces one pound less CO₂ than a conventional HVAC system.
 - No on-site combustion, no carbon monoxide
- **Efficient/ Reliable**
 - 30-60% less energy cost annually
 - Performs both cooling and heating efficiently (Heat supply 100F+)
 - Well field 50+ year solution
 - Single unit failure does not affect the rest of the system
 - 200+ installations and 2000+ schools in US – Not an experiment

GEOHERMAL SYSTEM – BENEFITS/ INTANGIBLES



- **Economical**
 - Similar first cost to Central Plant
 - Competitive option for retrofit projects
 - No water resource required – closed loop system
 - No exterior equipment
 - No vandalism, hail/ sun damage or roof leaks
 - Maintains roof/ envelope integrity
 - Low parts and labor costs,
 - No Annual On-Call fees
- **Functional**
 - Simple individual space control
 - Dedicated unit/ pump per classroom on Zone
 - Flexible Design: Single building or entire campus; single level building or multi-story building
 - Flexible construction for future renovations/ additions/ internal spatial changes

HVAC LIFE CYCLE COST FOR ELEMENTARY SCHOOLS						
IMAGE ENGINEERING GROUP, LTD			GRAPEVINE, TX SCOTTSDALE, AZ			
SYSTEM TYPE	TOTAL SYSTEM COST***	ANNUAL MAINT COSTS	ANNUAL ENERGY COSTS **	SIMPLE PAYBACK (YEARS)*	20 YEAR LIFE CYCLE	REMARKS
DESERT VIEW ELEMENTARY CAMPUS - 5 CLASSROOM DEMO PROJECT - 5213 SQ FT						
AIR COOLED RTU'S						
HIGH EFFICIENT AIR COOLED RTU's	\$62,500.00	\$3,127.80	\$9,796.00	0.0	\$302,226.00	
GEOHERMAL HEAT PUMPS						
GEO UNITS AND WELL FIELD	\$116,280.00	\$1,042.60	\$4,898.00	7.7	\$118,812.00	
LIFE CYCLE COST SAVINGS					\$183,414.00	

* PAYBACK BASED ON ENERGY AND MAINTENANCE SAVINGS ONLY

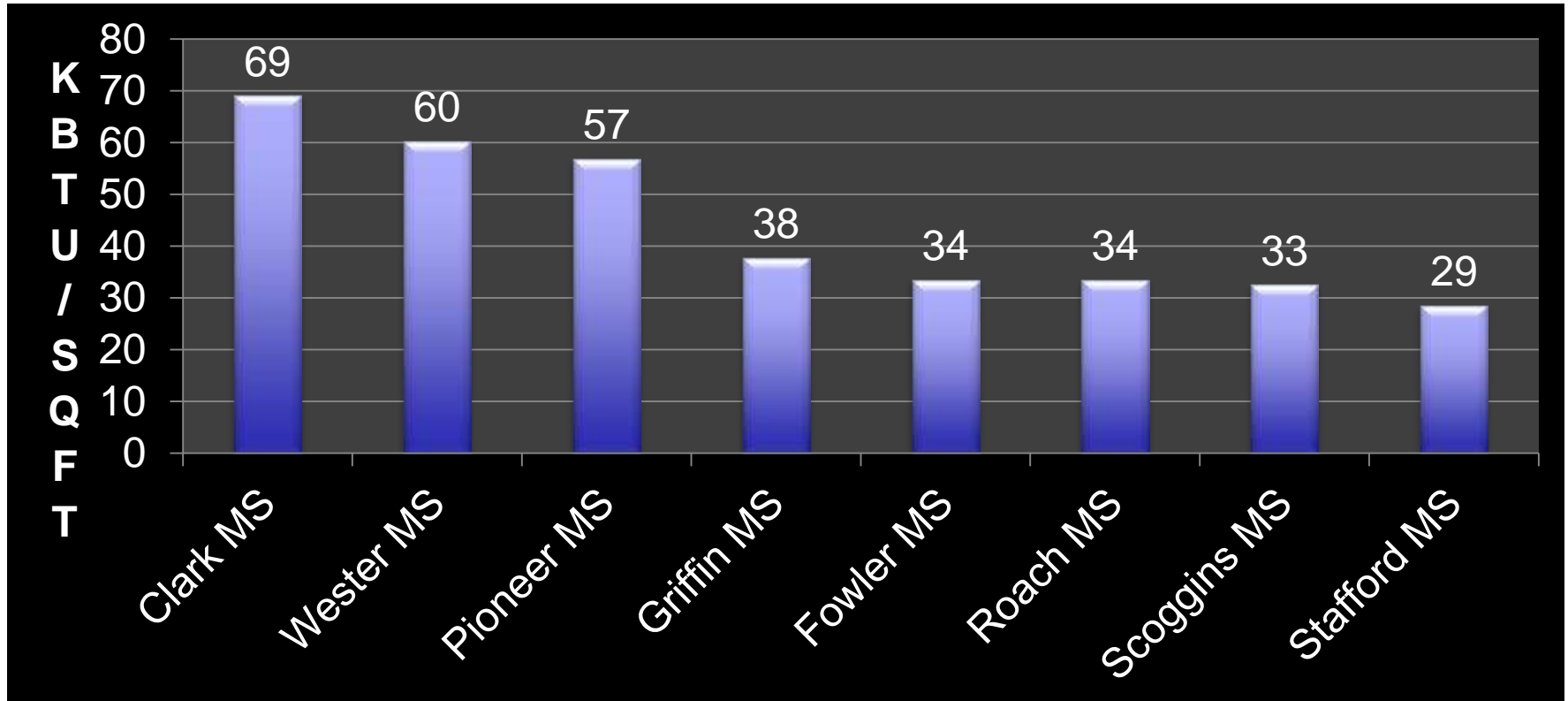
** COSTS 2008/2009 ARE ACTUAL, NOT ADJUSTED FOR INFLATION OR ESCALATION

*** OVERALL COSTS OF \$137,655 LESS COST OF \$11,375 FOR CLOSET AND \$10,000 FOR ENERGY MONITORING

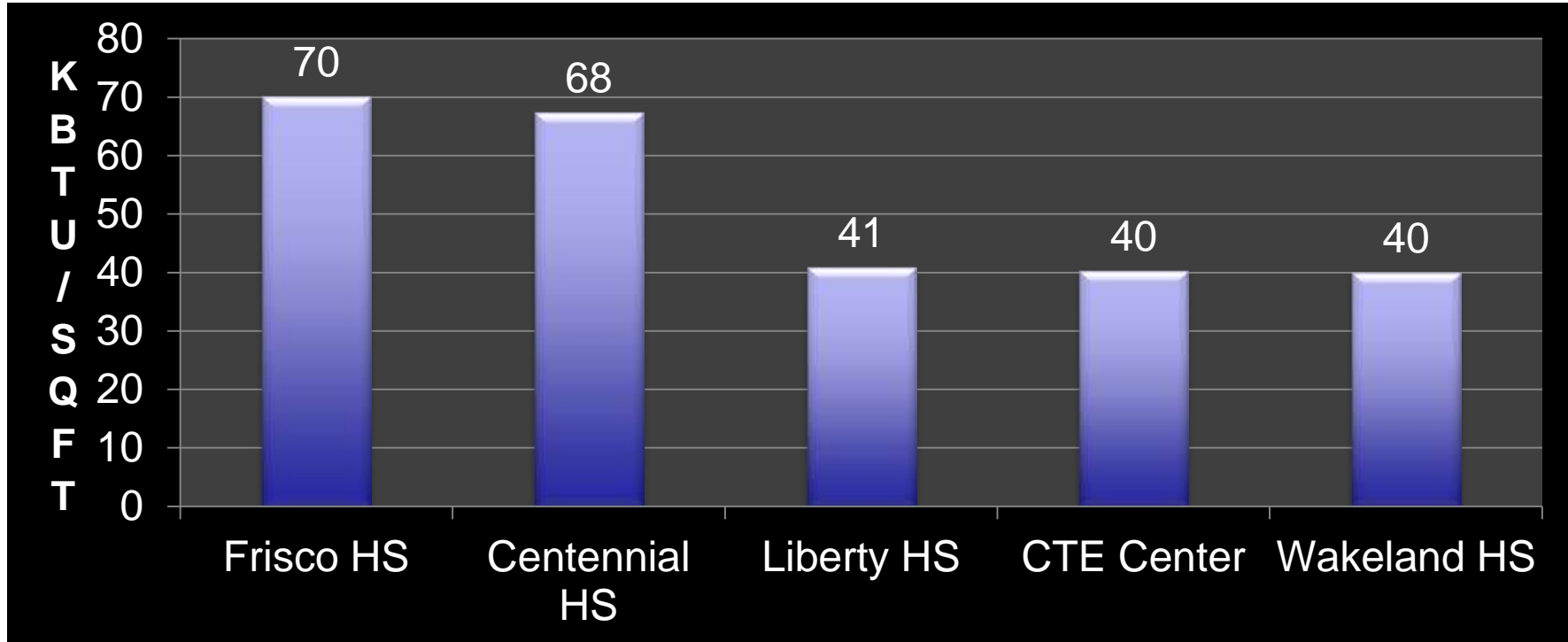
FRISCO ISD MIDDLE SCHOOLS COMPARISON – YEAR 2008 – 2009

Schools – Clark thru Wester are Chilled/Heating Water Systems

Schools – Griffin and Roach are Geothermal Heat Pump Systems



FRISCO ISD HIGH SCHOOLS COMPARISON – YEAR 2008-2009
Frisco HS – Chilled/Heating Water System
Centennial HS – Chilled/Heating Water System – Thermal Storage
Wakeland/Liberty/CTE Center HS – Geothermal Heat Pump System



FRISCO ISD SCHOOLS MECHANICAL COST COMPARISON

CAMPUS	YEAR BID	SQ FT	MECH COST*	\$/ SF
Bright Elementary	2001	71,860	\$968,922	\$13.48
Spears Elementary	2002	74,555	\$970,621	\$13.56
Riddle Elementary – Geo	2003	72,848	\$981,284	\$13.47
Pink Elementary – Geo	2004	76,000	\$1,054,261	\$13.87
Pioneer Middle	2001	137,245	\$1,676,435	\$12.21
Wester Middle	2001	137,245	\$1,676,435	\$12.21
Griffin Middle – Geo	2002	138,651	\$1,679,000	\$12.11
Roach Middle – Geo	2004	138,650	\$1,709,000	\$12.33

- Includes Controls and Condensate Drains / Costs are not adjusted for inflation or escalation
- 2006 Costs are \$15 to \$16 per square foot

*Table C-8a. Statistics for Total HVAC Maintenance Costs
for Individual Facilities with In-House HVAC Maintenance Personnel
When Classified by Type of Distribution System Used in Facilities*
(Costs in Cents per Square Foot)*

<i>Type of Distribution System</i>	<i>Number of Facilities</i>	<i>Mean Cost</i>	<i>Standard Deviation</i>	<i>25th Percentile Cost</i>	<i>Median Cost</i>	<i>75th Percentile Cost</i>
Single zone	30	53.08	70.49	15.70	31.60	61.90
Multi-zone	21	45.49	34.54	21.90	30.00	68.00
Dual duct	8	48.41	30.82	23.95	55.55	68.90
Variable-air-volume	52	38.26	44.36	9.45	26.95	51.90
Constant volume	23	47.25	36.95	19.70	37.50	78.80
Two-pipe fan coil	12	36.58	30.36	8.15	36.00	55.70
Three-pipe fan coil	1	44.00	n/a	44.00	44.00	44.00
Four-pipe fan coil	8	53.05	34.17	31.95	44.65	81.35
Induction	6	57.48	37.16	39.10	46.15	92.50
Baseboard and finned-tube radiation	1	78.20	n/a	78.20	78.20	78.20
Radiant panel	3	38.10	30.75	8.40	36.10	69.80
Unit ventilators	7	67.46	54.18	8.40	68.00	131.30
Valance unit	1	69.80	n/a	69.80	69.80	69.80
Packaged terminal air conditioners	6	48.55	36.79	8.40	52.95	69.80
Water-source heat pumps	4	113.85	109.20	50.90	74.30	176.80
Packaged terminal heat pumps	1	69.80	n/a	69.80	69.80	69.80
Geothermal heat pump system	41	18.44	26.09	3.70	6.70	20.20
Other heat pump system	4	56.00	67.40	11.30	31.75	100.70
Other types	24	8.73	10.39	1.95	5.85	11.35